

# Fiberassign performance

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## Abstract

In this document I show that fiberassign meets the desired performance in terms of fiber usage for science targets, calibration targets, sky-monitoring locations and Guide/Focus/Alignment targets.

## 1 Introduction

fiberassign is the software that performs the assignment of fibers to DESI targets.

The following are the minimal requirements on its performance

- Fiber assignment uses required fraction of fibers IN.DAT-7002
- Fiber assignment provides sufficient calibration fibers IN.DAT-7003

In this document I present the results of running fiberassign on targets from DR7 to demonstrate how the two requirements mentioned above are met. Furthermore I list some computational performance results to understand how long does it take to run the code and how many resources does it use.

## 2 Software and input data

For this report I use tag 0.10.1 of fiberassign.

The input targetting data comes from DR7. On NERSC the files can be found here: `/project/projectdirs/desi/target/catalogs/dr7.1/PR372/`

The targetting files need to be prepared in order to pass them to fiberassign. The code that prepares the data and runs fiberassign can be found here: [https://github.com/forero/fiberassign\\_explore/blob/master/main.py](https://github.com/forero/fiberassign_explore/blob/master/main.py). The script needs to be executed as `python main.py --program dark --size large` to produce the outputs analyzed in this report.

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### 3 Results

We only use target that can be observed in dark time. With this restriction we end up with 7098 DESI tiles that correspond to dark time and overlap with the DR7.1 footprint. This selection returns 36M targets, 1.3M standard stars and 25M sky locations.

Runnig this code on a Cori login node takes 2 hours to run an uses a peak of 38GB of RAM. The wallclock time is proportional to the number of tiles. In this case we have that the code assigns on average one tile per second.

Figure 1 show the results from an individual tile. Each panel shows different kinds of targes:

- SKY: fibers for sky calibration.
- STD: fibers on standard stars.
- SCIENCE: fibers on science targets.
- GFA: targets on Guide/Focus/Aligment cameras.
- SKYETC: Sky monitoring fibers for the Exposure Time Calculator.

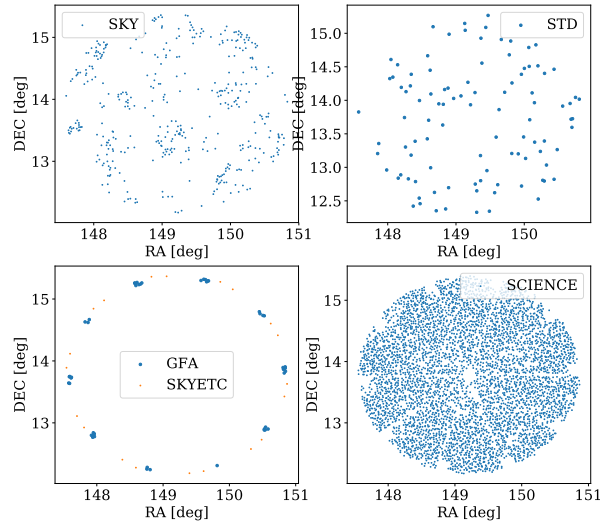


Figure 1: Results from a single tile. Each panel shows the different kinds of targets that are stored in the outputs.

Figure 2 show the total number of assigned fibers for every tile. Close to the boundary there are some tiles with a low number of assigned fibers. This is due to the small overlap between those tiles and the DR7.1 footprint; from the

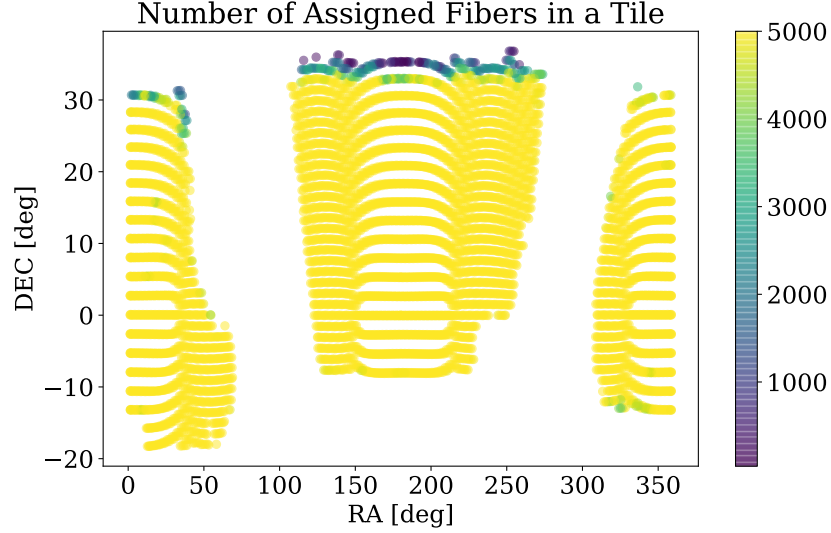


Figure 2: Total number of assigned fibers for every tile. In the upper region the low number of assigned fibers is explained by the small overlap with the DR7 footprint. The same effect is observed for some tiles close to the galactic plane.

beginning a small number of targets are available for those targets. For most of the tiles all the 5K fibers are assigned.

In order to produce robust statistics on the number of used fibers for sky, standards and science targets we discard the tiles above a declination of 20 degrees and below  $-5$  degrees. This cut leave 3884 tiles to be analyzed.

Figure 3 shows the histograms of the number of used fibers per tile. The label shows the average and the standard deviation computed over the tiles. This Figure shows that on average 99.92% of the fibers are used, on average 397 are used for sky locations and 99 are used for standard stars. On average 4499 science targets are observed per tile. The small fluctuations in the number of sky location and standard star fibers is due to changes in the input number densities for those targets. The input sky and stdstar catalogs must be tuned to have everywhere the desired number of targets per tile.

Figure 3 demonstrated that fiber assignment uses the required fraction of fibers and provides sufficient calibration targets.

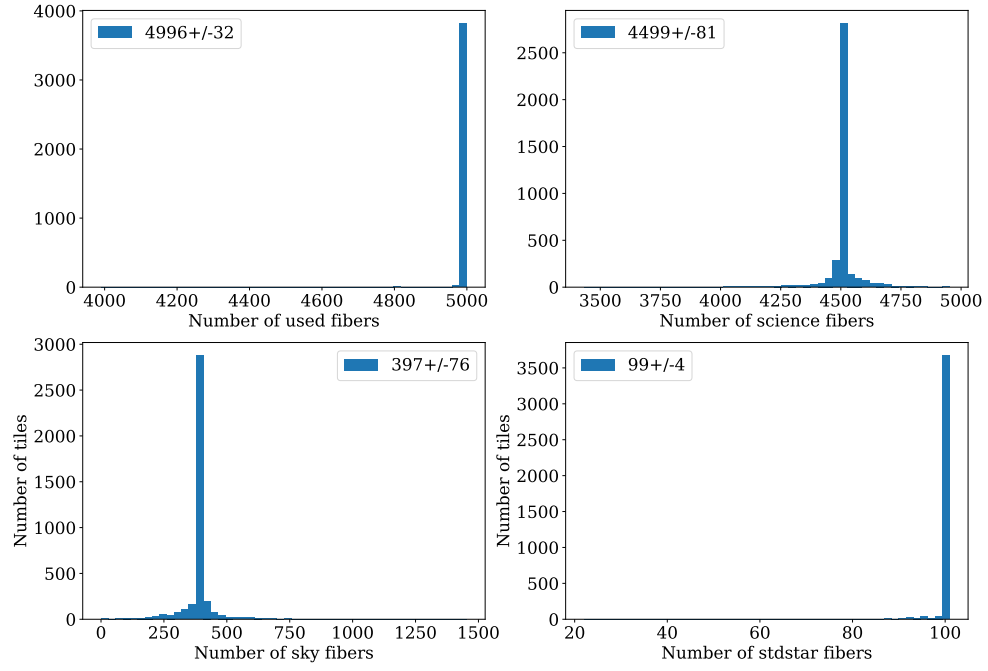


Figure 3: Total number of assigned fibers for every tile. In the upper region the low number of assigned fibers is explained by the small overlap with the DR7 footprint. The same effect is observed for some tiles close to the galactic plane.